

NON-PUBLIC?: N
ACCESSION #: 8806290286

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Wolf Creek Generating Station PAGE: 1 of 11

DOCKET NUMBER: 05000482

TITLE: Personnel Error - Improper Maintenance Actions Cause Fatality And
Results In Engineered Safety Features Actuations And Loss Of Residual
Heat Removal
EVENT DATE: 10/14/87 LER #: 87-048-01 REPORT DATE: 06/24/88

OPERATING MODE: 6 POWER LEVEL: 0

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR
SECTION
50.73(a)(2)(iv), 50.73(a)(2)(v), 50.73(a)(2)(vii), 50.73(a)(2)(x), OTHER
SPECIAL REPORT

LICENSEE CONTACT FOR THIS LER:

NAME: Merlin G. Williams, Superintendent of Regulatory, Quality and
Administrative Services
TELEPHONE #: 316-364-8831

COMPONENT FAILURE DESCRIPTION:

CAUSE: X SYSTEM: EB COMPONENT: PT MANUFACTURER: G080
REPORTABLE TO NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On October 14, 1987, at approximately 2037 CDT, an Unusual Event (UE) was declared due to a fire being reported in the Engineered Safety Features (ESF) switchgear room. It was discovered that a worker had come in contact with an energized part of the 'B' train safety-related 4160 volt ESF bus. Subsequent operator action (deenergizing the 'A' train 4160 volt ESF bus to deenergize the cross-tie to the 'B' train ESF bus) resulted in a loss of the Residual Heat Removal (RHR) system for approximately 17 minutes and an automatic actuation of 'A' Diesel Generator. The UE was exited at approximately 2111 CDT after RHR was restored. The diesel start and shutdown sequencer actuation are being reported per 10CFR 50.73(a)(2)(iv). The loss of RHR is being reported per 10CFR 50.73(a)(2)(v) and 10CFR 50.73(a)(2)(vii). The fire and the fatality are being reported per 10CFR 50.73(a)(2)(x). The diesel generator failure is being reported to satisfy the Special Report requirements of Regulatory Guide 1.108.

Detailed investigation determined that the ultimate cause of the accident was the failure of the qualified electrician to follow the maintenance procedure governing the work which required him to check the stationary disconnects for high voltage potential prior to doing any work in a potential transformer cabinet. Various corrective actions have been taken to prevent recurrence including meetings with personnel, reemphasizing work rules, and procedural enhancements.

(End of Abstract)

TEXT: PAGE: 2 of 11

INTRODUCTION

On October 14, 1987, at approximately 2037 CDT, an Unusual Event (UE) was declared due to a fire reported in the Engineered Safety Features (ESF) switchgear (EB-SWGR) room. It was subsequently discovered that a worker had come in contact with an energized part of the 'B' train safety-related 4160 volt ESF bus (EB-BU) NB02. Subsequently, operator action to deenergize the 'B' train bus resulted in an automatic actuation of 'A' Diesel Generator (EK-DG) and a loss of the Residual Heat Removal (BP)(RHR) system for approximately 17 minutes. The UE was exited at approximately 2111 CDT. The diesel generator (EK-DG) start and shutdown sequencer (JE) actuation are being reported per 10CFR 50.73(a)(2)(iv). The loss of RHR is being reported per 10CFR 50.73(a)(2)(v) and 10CFR 50.73(a)(2)(vii). The fire and the fatality are being reported per 10CFR 50.73(a)(2)(x). The diesel generator invalid failure is being reported to satisfy the Special Report requirements of Regulatory Guide 1.108. The unit was in Mode 6, Refueling, at the time of this event.

DESCRIPTION OF EVENTS

During the early evening shift on October 13, 1987, a Shift Supervisor was preparing the clearance order to tag out the NB02 bus (EB-BU) (4160 volt ESF train 'B' switchgear bus) for switchgear inspection and testing which was scheduled to be performed the next day. The question came up if the No. 2 ESF transformer (EA-XFMR)(XNB02) (which is the normal feed to NB02 bus) should be tagged out. The Shift Supervisor called one of the Electrical Supervisors and discussed leaving XNB02 energized in order to maintain alternate feed to NB01 bus in case the normal feed to NB01 bus and the 'A' diesel generator were to fail. The Electrical Supervisor did not review an electrical schematic during this discussion and misunderstood what the Shift Supervisor was asking. He thought the Shift Supervisor was referring to the fact that the alternate feed from the No. 1 ESF transformer (EA-XFMR) (XNB01) would be left energized which would leave the line side of breaker NB0212 (EB-BKR) energized

(See Figure 1). The Electrical Supervisor knew this was common practice because the only way this line could be deenergized would be to deenergize NB01 bus, which was not allowed by Technical Specification. The Electrical Supervisor also thought that the Shift Supervisor was referring to the fact that the potential transformer (PT) cabinet (EB-PT) on NB0212 could be cleaned after the outage by deenergizing NB01 and deenergizing XNB01. The Shift Supervisor prepared and hung the clearance, leaving XNB02 energized, thinking that the electrical group understood and agreed to this. Figure 1 shows the energized parts of bus NB02 with the sources of their power following this clearance.

TEXT: PAGE: 3 of 11

The cleaning and inspection of bus NB02 began on day shift on October 14. The Maintenance Procedure (MPE E009Q-01) requires that the workman check the stationary disconnects (EB-DISC) (rossettes) using a high voltage gloves and tester to ensure that there is no voltage present in each cubicle. A later step in the procedure calls for the workmen to clean and check the insulators and stationary disconnects (rossettes) for damage. Even though this step says to clean, it was understood by the electrical group that this means clean if necessary and it has rarely been necessary to clean them. A visual check was done and the cubicles verified by Quality Control (QC). Due to considerable congestion in the work area, the day shift electricians decided not to check all the stationary disconnects (rossettes) for voltage as the procedure required. The only cubicle (EB-CAB) (area on the bus that houses each breaker) checked was NB0207 (normal feed to Component Cooling Water Pump 'D' (CC-P)) because the visual inspection revealed some possible bent fingers on the stationary disconnects (rossettes) on this cubicle. Bus NB02 has 17 breaker cubicles numbered from NB0201 to NB0217. Bus NB01 has a similar numbering system.

The day shift inspected cubicles NB0201 through NB0209 excluding the PTs. The night shift then finished the inspection on the cubicles and started on the PTs, which is a separate section of the procedure.

An electrical technician, who was a contractor working for the electrical group during the outage, was on top of the switchgear cleaning PT cubicles. He was working under the supervision of the Senior Electrician that was the lead person on the job. After completing the cleaning and inspections of the remainder of the cubicles, they decided to start on the PT drawers. The Senior Electrician unlocked the PT drawers and pulled them out. These drawers are arranged in such a way that when the drawers are pulled out, the pulled out part of the drawer is deenergized. The electrical technician suggested that they pull the tops off the PT cubicles in order to do a better job of cleaning and inspecting. The Senior Electrician agreed to

this. They had removed the tops from two of the deenergized PT cabinets, cleaned and inspected them, and discovered what appeared to be some minor crack like indications in the insulating bushings. The Senior Electrician left the top of the switchgear in order to contact Maintenance Engineering to request a field inspection of the insulating bushings. The electrical technician said he would go ahead and remove the tops from the next two cabinets and get started cleaning them.

TEXT: PAGE: 4 of 11

While the Senior Electrician was contacting Maintenance Engineering, he heard what he thought was someone calling for help. He immediately returned to the cabinet and found the electrical technician laying face down across the top of the NB0210 and NB0212 PT cabinets with his arms apparently in the NB0209 PT cabinet. The technician was unconscious and had apparently contacted 4160 volts in the cabinet, which was still energized from transformer XNB02. Several other electricians working in the area also heard the cry and responded to the scene. Some of the electricians attempted to pull the individual free with belts and plastic hoses, but were unable to do so. They did not touch the individual as they believed that he was still in contact with energized equipment. The technician's sleeve was ignited by the arcing current causing an automatic fire alarm actuation (IC) and initiation of the Halon Fire Protection System (KQ) forcing the electricians out of the ESF switchgear rooms. An electrician called Control Room (NA) personnel and told them that there was a fire in the ESF switchgear room.

The UE was declared at 2037 CDT because of the fire in a safety-related equipment area. A subsequent notification to the Control Room informed operators that there was a man hung up in some energized equipment in the ESF switchgear room. The fire brigade was assembled at the fire brigade lockers, which are located just outside the ESF switchgear rooms (Figure 2). One of the electricians informed the fire brigade leader (a licensed operator) that there was no longer a fire, but incorrectly stated that there was a man hung up on cubicle NB0212 and that there was an indicated voltage of 4100 volts. The fire brigade leader then informed control room personnel that there was a man on top of the alternate feed for bus NB02 (cubicle NB0212). In an attempt to deenergize this cubicle, the normal (cubicle NB0112) feed to NB01 was opened. This was done in case there was an equipment malfunction and the electrical flow path was not as expected. This removed power from bus NB01, and resulted in a loss of power to RHR. The off-normal procedure that covers loss of shutdown cooling (OFN 00-015) was entered. Deenergizing bus NB01 also caused diesel generator (D/G) 'A' to automatically start and repower bus NB01. The loss of RHR was from the time of the D/G start (2035 CDT) until RHR was restored (2052 CDT), approximately 17 minutes. It was later evaluated that since T/S allow removal of RHR from service for one hour per eight hours under certain conditions, the loss of RHR

for 17 minutes did not violate T/S requirements. The Reactor Coolant System (AB)(RCS) temperature did not increase during the time RHR was deenergized.

When the fire brigade leader called back and said there was still an indicated voltage of 4100 volts on NB0212, control room personnel then removed all power sources from both ESF busses, NB01 and NB02. This was done by putting D/G 'A' in pull-to-lock, verifying breaker PA0201 (EA-BKR) (feeder from #1 startup transformer (EA-XFMR) to bus XNB02) was tripped, and tripping switchyard breaker 13-48 (EA-BKR) (feeder from switchyard transformer #7 (FK-XFMR) to XNB01) (See Figure 1).

TEXT: PAGE: 5 of 11

The fire brigade then removed the man from the top of cubicle NB0209 and he was transported for medical treatment. Plant management was later notified by the hospital that the man had died of his injuries.

After the man was removed from bus NB02, control room personnel attempted to reenergize bus NB01 (to regain RHR) by starting D/G 'A'. The attempt to close D/G 'A' breaker was unsuccessful and bus NB01 was then reenergized from transformer XNB01 using NB0112 and breaker 13-48. RHR was restarted at approximately 2052 CDT and the UE was then terminated at approximately 2111 CDT.

ADDITIONAL ANALYSIS

When control room personnel were removing all power sources from NB02, one of the actions taken was to trip breaker PA0201. This is the feeder breaker from the #1 startup transformer to the 13.8 kilovolt (kv) bus PA02 (EA-BU) to transformer XNB02. The indication in the control room was that the breaker was already tripped. An operator then locally verified that PA0201 was tripped. Subsequent investigation showed that breaker PA0201 tripped and locked out immediately after the individual came in contact with the energized PT. To reenergize cubicle NB0209, the lockout relay would have to be manually reset in cubicle NB0209.

At the time that power to the RHR system was deenergized, 60 fuel assemblies (AC) remained in the reactor vessel core (AB). The refueling pool (CF) level was greater than 23 feet above the reactor vessel flange (AB-RPV) as required by T/S. The temperature in the RCS remained at approximately 98 degrees Fahrenheit. An increase in RCS temperature was not detected.

After the individual was removed from the top of bus NB02, control room operators attempted to close the breaker from D/G 'A' to reenergize NB01. This attempt was unsuccessful and the operator then reenergized bus NB01 from transformer XNB01. This is considered to be an invalid failure of

the D/G. This report fulfills the requirement in Technical Specification 4.8.1.1.3 and 6.9.2, and Regulatory Guide 1.108 to report all valid or invalid failures of the D/G. Since this is an invalid failure, the testing frequency of the D/G does not change.

TEXT: PAGE: 6 of 11

The cause of failure was the operation of the Diesel Generator (D/G) controls in an unanticipated sequence. This sequence resulted in the inability to reset the D/G from the Main Control Board. Reset capability was available in the D/G room. A design enhancement has been made to allow reset of the D/G following the sequence encountered on October 14. The sequence that occurred on October 14, 1987, is the only time that this modification will be useful. It was not included in the original plant design because it was never anticipated that once a D/G started and loaded on the bus that it would be voluntarily secured by the operators. While it is certainly a useful feature, normal plant response to an accident is neither enhanced nor hampered by it.

The scope of this modification is to add an additional hand-switch contact from NEHIS25 (NEHIS26) to the diesel breaker NB0111 (NB0211) control circuit in series with the existing permissives and interlocks for the "close" portion of the circuit. The purpose of the new handswitch contact is to allow deenergization of the breaker anti-pumping relay in order to enable the breaker to be reclosed from the Control Room after the breaker is manually tripped from the Control Room via NEHIS25 (NEHIS26). The circuit is not changed with respect to the normal (automatic) breaker closure function associated with a design basis event. Consistent with the original design, this modification does not allow breaker reclosure from the Control Room following a protective trip. All previous circuit permissives and interlocks to permit breaker closure are preserved and are unaffected by this modification, including the breaker "trip-free" feature.

The subject modification will not affect the ability of the diesel generators to fulfill their safety design basis or requirements as discussed in USAR Sections 8.1.4.2 and 8.1.4.3.

Based on the above, the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated is not increased; the possibility for an accident or malfunction of a different type than any evaluated previously is not created; and the margin of safety as defined in the bases for any WCGS Technical Specification is not reduced.

ROOT CAUSE(S)

The ultimate cause of the accident was the failure of the qualified

electrician to follow the Maintenance Procedure governing the work which required him to check the stationary disconnects for high voltage potential prior to doing any work in the PT cabinet.

The failure of the work group to perform a comprehensive pre-job briefing prior to starting the work, on both shifts, was also a major factor in this accident.

TEXT: PAGE: 7 of 11

CONTRIBUTING CAUSES

Neither workmen nor supervisors verified that the clearance was what they expected by comparing the tagged out equipment listed on the clearance order against the electrical drawings. The electrical group working on NB02 was expecting the transformer side of cubicle NB0212 to be energized because they know it is the cross feed from the NB01 bus, but they were not expecting the transformer side of cubicle NB0209 to be energized and they did not check the clearance order to see if it was.

IMMEDIATE CORRECTION ACTION TAKEN

The work was stopped on the switchgear at the time of the accident and was not allowed to restart until an assessment of the accident and its primary causes evaluated and corrected.

The General Safety Committee met the following day with appropriate personnel in the maintenance group and thoroughly discussed the accident and began their investigation.

The Maintenance Procedure entitled "13.8 KV and 4.16 KV Switchgear Inspection and Testing" (MPE E009Q-01), was the procedure being used to control the work activity. Step 6.4.3 in the procedure states "Using the high voltage gloves and tester, check the stationary disconnects for high voltage potential." This step in the procedure is a precautionary step, which was to be accomplished prior to performing any cleaning or inspection activities in the potential transformer cabinet. This step was not followed and had it been, would have prevented this accident.

Plant management decided that the immediate corrective action which must be taken before work could be resumed, was to make this step a mandatory sign off step. The procedure was revised to incorporate this step as a mandatory sign off along with a double verification signature.

CORRECTIVE ACTIONS TAKEN TO PREVENT RECURRENCE

The following corrective actions have been taken to prevent recurrence of this type of event:

1. As an interim measure, the Vice-President Nuclear Operations has distributed a memo for station distribution which mandates that thorough pre-job briefings shall occur on all work activities, in or out of an outage. The pre-job briefing will be as short or as long as the job complexities require and will include as a minimum the following:

TEXT: PAGE: 8 of 11

a. Safety precautions for the job including the clearance order will be discussed.

b. The actual procedures or work instructions to be used will be reviewed.

c. A general discussion of the job complexities and potential problems will be made.

d. This function, or pre-job briefing, will repeat prior to each shift starting work in the field if a job is an on-going one.

2. Wolf Creek management temporarily suspended the Refueling II Outage because of this incident, coupled with three other incidents.

3. The Plant Manager mandated that all work groups hold group meetings to discuss the events, the causes, and corrective actions. These group meetings were held with all the work groups and extensive discussions with the groups included such key program elements as careful planning of our work, taking the time to do it right, and attention to detail. These group discussions also concentrated on each individual's responsibility to work safely, ensuring that our people are knowledgeable and comply with the work hour limitations, the necessity for paying attention to detail, performing a comprehensive pre-job briefing, ensuring that proper supervision is maintained on the job and ensuring that all people understand the importance of strict procedure compliance.

4. As a permanent corrective action, the administrative procedure (ADM 08-201) "Control of Maintenance and Modifications", which defines the policies and practices by which the plant controls maintenance and modification activities, has been revised to incorporate the requirements as outlined in the memos discussed above.

5. An engineering evaluation request has been submitted to evaluate the possibility of placing disconnects between the secondary windings and the PTs on the ESF bus feeders. An initial scoping meeting on this

issue has been conducted.

ADDITIONAL INFORMATION

The PT on cubicle NB0209 on the NB02 switchgear was damaged as a result of the accident. The PT was repaired prior to startup after completion of the Refuel II Outage.

TEXT: PAGE: 9 of 11

As of October 15, 1987, there have been forty-four (44) valid successful tests and eleven (11) invalid failures of Diesel Generator 'A'. There have been thirty-seven (37) valid successful tests and seven (7) invalid failures of Diesel Generator 'B'. The valid test failure described in Special Report 86-011 is the only valid failure that has occurred on either diesel unit. (Previous diesel generator failures are discussed in Special Reports 85-001, 85-002, 85-003, 85-004, 85-005, 85-006, 85-010-01, 85-012, 85-013, 85-015, 86-002 and 86-011).

The invalid failure discussed in this report had no effect on the diesel generator testing frequency of once per thirty-one days. This is in conformance with the schedule presented in Regulatory Position C.2.d.(1) of Regulatory Guide 1.108 and with Technical Specification Table 4.8-1, which require the testing interval to be not more than thirty-one days if the number of valid failures in the last 100 valid tests is one or zero.

During the course of the investigation of this incident, there was no evidence that any of the actual work performed was inadequate or performed in a non-professional manner which could jeopardize the proper functioning of any plant equipment. The procedure contains a number of QC verification steps for verification and sign off by QC as well as the workmen. All work steps and QC points were signed off. The PT was supplied by General Electric Corporation.

There have been several previous occurrences of personnel error causing ESF actuations, however, the circumstances surrounding this event are considered unique. Therefore, the corrective actions taken in those events are appropriate to those events and had no effect on this event. There have been no previous similar occurrences of personnel error causing fire and subsequent ESF actuations.

TEXT: PAGE: 10 of 11

FIGURE 1 - PARTIAL WCGS ELECTRICAL ONE-LINE DIAGRAM

FIGURE OMITTED - NOT KEYABLE (DIAGRAM)

TEXT: PAGE: 11 of 11

FIGURE 2

Partial Equipment Location
Control Building 2000' Elevation

FIGURE OMITTED - NOT KEYABLE (DIAGRAM)

ATTACHMENT # 1 TO ANO # 8806290286 PAGE: 1 of 1

WOLF CREEK
NUCLEAR OPERATING CORPORATION

Bart D. Withers
President and
Chief Executive Officer
June 24, 1988
WM 88-0145

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Subject: Docket No. 50-482: Licensee Event Report 87-048-01

Gentlemen:

The attached Licensee Event Report is submitted pursuant to 10 CFR 50.73(a)(2)(iv), (a)(2)(v), (a)(2)(vii), and (a)(2)(x). Additionally, a diesel generator invalid failure is being reported to satisfy the Special Report requirements of Regulatory Guide 1.108. This report is a revision to LER 87-048-01 which was submitted November 13, 1987.

Very truly yours,
/s/ B. D. Withers
Bart D. Withers
President and
Chief Executive Officer

BDW/jad
Attachment
cc: B. L. Bartlett (NRC), w/a
D. D. Chamberlain (NRC), w/a
R. D. Martin (NRC), w/a
P. W. O'Connor (NRC), w/a (2)

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